3/23/2010

Hydrogen – The Power of "And"

Virginia Clean Cities

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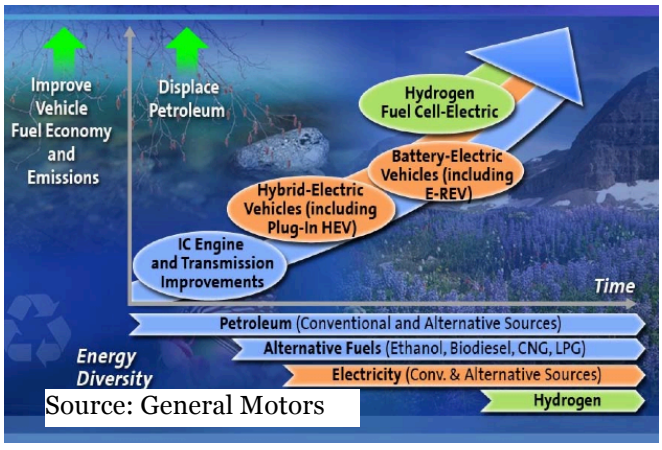
Hydrogen Fuel Cell Policy Perspective –

"How can we work together with a collective will to enable all promising technology solutions to quickly and efficiently reach market tipping points and deliver their optimal interdependent value to consumers and the world?" Britta Gross, General Motors

A Forward-Thinking Domestic Transportation Future

Hydrogen has a strong potential to serve as a leading transportation fuel to power electric vehicles. While commercial passenger transportation applications are rapidly approaching, continued research and deployment experiments will benefit the technology and position leading research countries for success as fuel cell vehicles reach wider adoption. The U.S. has been a recognized leader in developing hydrogen and fuel cell technologies, and Department of Energy analysis projects that transitioning to a hydrogen economy would yield a net increase in U.S. employment of nearly 58,010 to 182,840 by 2020 and 360,740 to 674,500 by 2050.

Over the last seven years, the fuel cell components at major manufacturers have become smaller and more powerful, reaching parity with conventional engines. Honda's fuel cell stack for example has lost 4/5ths of its weight and 3/4ths of its size and provides an impressive 100kw of power allowing fuel cell vehicles to have substantial range and now easily go 300 miles to a tank. The technology is durable too, as GM's 5th generation fuel cell stack has shown durability to 120,000 miles.



Source: General Motors

Many vehicle technology improvements go together and continue to advance the goal for improved petroleum displacement, as well as economic, national, and environmental security. Because of the high energy density of hydrogen, fuel cell technology has the potential to move efficient electric vehicles longer distance than batteries. As policymakers move towards enhanced battery technology, we should be conscious of the opportunity of technology beyond batteries, and that fuel cells represent a complementary technology for extended endurance in larger electric vehicles.

What is a Fuel Cell?

Hydrogen fuel cells typically run compressed hydrogen (H2) through a catalyst, which separates the electrons and protons. The electrons travel to an electric motor before catching up with the protons. When the positively charged H2 joins with oxygen the byproduct is water vapor.

"Bigger Batteries"

Fuel Cell vehicles are electric vehicles. A fuel cell generates electricity from hydrogen energy stored in a fuel tank. A hydrogen fuel cell system can be considered just another type of chemical "battery" that produces power through an electric motor.

Clean and Safe

Hydrogen is seen as an excellent transportation fuel because it can be transferred quickly and safely, it can be generated from a variety of domestic conventional and renewable sources, and because it emits predominantly water vapor when converted to energy. Using natural gas to make hydrogen for fuel cell vehicles would reduce overall greenhouse gases by 50% for every gasoline vehicle replaced, and a fuel cell vehicle using hydrogen produced from water using renewable energy produces no exhaust emissions other than water vapor. This is why a transition to hydrogen fuel cell electric vehicles is one real way our society can cut greenhouse gas pollution from the transportation sector by 80% below 1990 levels.

Transportation

Even with reduced national attention in recent years, hundreds of fuel cell vehicles have experienced considerable testing and collectively logged millions of miles. Hyundai, Daimler, Honda, Toyota, and GM are expecting to commercialize and sell thousands of fuel cell vehicles between 2015 and 2020. These vehicles are generally full-sized or SUV vehicles.

Source: General Motors

Source: Hyundai-Kia

Source: Toyota

Source: Honda

By investing in a range of vehicle fuel technology and continued research efforts with an eye towards the future deployment and long term transitions, we can put ourselves on a path towards success and mitigate the economic, environmental, security, and global instability challenges of our dependency on oil.

Additional Contemporary Hydrogen Fuel Cell Applications

Hydrogen fuel cells have a long history in military and government applications, including providing electrical power on U.S. manned space missions. As automotive manufacturers continue to advance hydrogen fuel cell technologies for the strenuous demands and of the automotive duty cycle, hydrogen fuel cells are entering the marketplace today for other applications.

Similar to their use in automobiles, hydrogen fuel cells are being utilized today to power materials handling equipment. By the end of 2008, there were 200 hydrogen fuel cell-powered forklifts operating in the U.S., consuming at least 20,000 kg of hydrogen and operating at 16 sites in nine states (NHA 2008 Market Report). In addition to those numbers, and as a further example, the Defense Logistics Agency is in the second year of a successful pilot for fuel cell electric forklifts at the Defense Depot in Susquehanna, Pennsylvania.

Hydrogen fuel cells also excel at providing electricity for stationary appliances, at least 13,000 kilowatt (kW) of PEM fuel cells were operational in the U.S. in 2008, the vast majority of which were installed to provide backup power.